Attorney Docket No. 1449/5

UNITED STATES PATENT APPLICATION

SHIELD APPARATUS FOR POWER TRIMMER

Inventor: Adam G. Hanes
Kevin D. King

Assignee: Honda Giken Kogyo Kabushiki Kaisha

Entity: Large

JENKINS & WILSON, P.A.
Suite 1400, University Tower
3100 Tower Boulevard
Durham, North Carolina 27707
Telephone: 919-493-8000
Facsimile: 919-419-0383

"Express Mail" mailing number ER 237503355 US
Date of Deposit July 30, 2003
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. 1.10 on the date indicated above and is addressed to the Commissioner for Patents, Washington, D.C. 20231
Bonnie S. Sheridan
Bonnie S. Sheridan

Description

SHIELD APPARATUS FOR POWER TRIMMER

Technical Field

The present invention generally relates to power trimmers for cutting vegetation and the like. More particularly, the present invention relates to a shield apparatus for preventing or at least minimizing contact between vegetative matter and a rotating shaft of such trimmers.

Background Art

Many powered trimmers of various designs have been developed and commercialized for use by an operator in cutting or trimming vegetation such as grass, weeds, and brush. In a typical configuration, an example of which is disclosed in U.S. Patent No. 5,077,898 to Hartwig, the powered trimmer includes a motor powered by electricity or a combustive fuel such as gasoline or a gasoline/oil mixture. The motor typically provides rotational driving power to a cutting mechanism that includes one or more cutting cords of nylon or metal or a set of cutting blades. The motor and cutting mechanism are mounted to an elongate boom that is held by the operator during use of the trimmer. Typically, the trimmer is balanced by mounting the motor and cutting mechanism at opposite ends of the boom. This configuration requires that a

drive shaft be disposed within the length of the boom to interconnect the rotating output component of the motor with the rotating cutting mechanism. To enable the operator to comfortably wield the trimmer in an upright standing or walking position, the cutting mechanism is often situated at an angle in relation to the motor and/or the boom. Accordingly, a angled gear case or trimmer head is commonly interposed between the boom and the cutting mechanism, with the drive shaft of the boom connected to one end of the gearing of the gear case and the cutting mechanism connected to an output shaft extending from the gear case.

During operation of a typical trimmer such as described hereinabove, as the cutting mechanism rotates, its cords or blades cut through the targeted vegetation and throw clippings outwardly. Moreover, the cutting mechanism often encounters objects such as rocks, pieces of wood, and other debris, which can also be thrown by the cutting mechanism. To protect the operator of the trimmer from injury inflicted by clippings and objects thrown by the cutting mechanism, it is common for trimmers to include a shroud or guard mounted to the gear case or boom so as to shield the operator from the thrown objects. Most clippings guards are positioned only in the frontal area between the cutting mechanism and the operator, as disclosed in aforementioned U.S. Patent No. 5,077,898. Other clippings guards are designed to completely surround a portion of the cutting mechanism as disclosed in U.S. Patent No. 6,260,278 to Faher, or to surround the entire cutting mechanism as disclosed in U.S. Patent No. 6,301,788 to Webster.

It can be appreciated by persons skilled in the art that while guard structures have thus been provided to protect the operator of the trimmer from clippings and other matter cut or thrown by the cutting mechanism, trimmers have in the past failed to provide any guarding means for preventing clippings from contacting the output shaft of the gear case or trimmer head. It is well-known that clippings, and even blades of grass that have yet to be cut, have a strong tendency to wrap around the exposed portions of this output shaft as the output shaft rotates, or otherwise to become bound to or contact the output shaft. Such contact between vegetative matter and the output shaft can have a number of deleterious effects. For example, the bound vegetative matter can impede rotation of the output shaft, causing damage or premature wear of the gearing and motor provided with the trimmer. Moreover, an accumulation of vegetative matter on the output shaft can interfere with the performance of the cutting mechanism in uniformly cutting targeted areas of vegetation and effectively clearing clippings from the immediate vicinity of the cutting elements, especially in the case of nylon cords. Additionally, the binding of vegetative matter increases the frequency of maintenance required for the trimmer, such as cleaning, as well as the time required to perform maintenance.

In view of the foregoing, it would therefore be advantageous to provide a power trimmer with a shield apparatus for preventing or at least minimizing contact between vegetative matter and the output shaft of such trimmer.

Summary

A shield apparatus is provided for use with a power vegetation trimmer. The shield apparatus is adapted for preventing vegetative matter from contacting a rotating output shaft of the vegetation trimmer, or at least minimizing such contact. The shield apparatus can be mounted in coaxial relation with the output shaft and can be provided as an accessory or after market component for installation to an existing trimmer. Alternatively, the shield apparatus can be provided with the trimmer as part of the initial manufacture or assembly thereof.

According to one embodiment, the shield apparatus comprises a first lateral wall, a transverse shield wall, and a second lateral wall. The first lateral wall is coaxially disposed about a central axis of the shield, and comprises a radial dimension relative to the central axis. The transverse shield wall is transversely disposed relative to the central axis and adjoins the first lateral wall. The transverse shield wall comprises an aperture coaxially disposed about the central axis to permit extension of the output shaft of the vegetation trimmer therethrough. The first lateral wall and the transverse shield wall define a first interior of the shield. The first lateral wall is adapted for enclosing at least a portion of a cutting mechanism of the vegetation trimmer. The second lateral wall is coaxially disposed about the central axis on an outer side of the transverse shield wall opposite to the first interior. The second lateral wall comprises a second radial dimension relative to the central axis that is less than the first radial dimension. The second lateral wall defines a second interior of the shield. The second lateral wall is adapted for enclosing at least a

portion of a head member of the vegetation trimmer from which the output shaft extends.

According to another embodiment, the shield apparatus comprises an adapter member that is adapted for mounting to the output shaft of the vegetation trimmer for rotation therewith. The adapter member is also adapted for mounting the shield apparatus in non-contacting relation to the output shaft. The adapter member comprises a hollow cylindrical portion extending through the aperture of the transverse shield wall, a first annular adapter plate, and a second annular adapter plate. The first annular adapter plate is coaxially disposed around the cylindrical portion and disposed in the first interior. The second annular adapter plate is coaxially disposed around the cylindrical portion and disposed in the second interior.

According to yet another embodiment, a trimmer head assembly is adapted for use with a power vegetation trimmer. The trimmer head assembly comprises a head member and a shield apparatus. The head member comprises a proximal head section adapted for attachment to the vegetation trimmer, a distal head section, and a rotatable output shaft extending outwardly from the distal head section along a longitudinal axis. The output shaft is adapted for rotatably driving a cutting element that is attachable to the output shaft. The shield apparatus is adapted for preventing vegetative matter from contacting the output shaft. The shield apparatus comprises first and second outer walls coaxially disposed about the longitudinal axis. The first outer wall is adapted to circumscribe at least a portion of the cutting element by a distal annular gap. The second outer wall is adapted to circumscribe at least a

portion of the distal head section of the head member by a proximal annular gap. According to one aspect, the respective widths of the distal and proximal annular gaps range from approximately 1 mm to approximately 10 mm. Preferably, the widths can range from approximately 1 mm to approximately 2 mm.

According to still another embodiment, a trimmer assembly adapted for use with a powered vegetation trimmer comprises a head member, a cutting element, and a shield apparatus. The head member comprises a proximal head section adapted for attachment to the vegetation trimmer, a distal head section, and a rotatable output shaft extending outwardly from the distal head section. The cutting element is attached to the output shaft and is rotatable therewith. The shield apparatus is disposed around the output shaft between the distal head section and the cutting element. The shield apparatus comprises a first lateral surface coaxially disposed about at least a proximal region of the cutting element nearest to the distal head section. The shield apparatus defines a distal annular gap between the first lateral surface and the cutting element. According to an aspect of this embodiment, the cutting element can comprise an annular rim that is enclosed by the first lateral surface. The annular rim and the first lateral surface define the distal annular gap. According to another aspect of this embodiment, the shield apparatus can contact the output shaft. According to a further aspect of this embodiment, the shield apparatus can comprise a transverse shield wall that adjoins the first lateral surface and has an aperture through which the output shaft extends.

According to an additional embodiment, a powered vegetation trimmer comprises an elongate member, a head member, a motor, a cutting element, and a shield apparatus. The elongate member comprises a distal end. The head member comprises a housing that is mounted to the distal end and a rotatable output shaft. The motor is mounted to the elongate member in communication with the output shaft for transmitting torque thereto, and the cutting element is attached to the output shaft and is rotatable therewith. The shield apparatus is disposed around the output shaft between the head member and the cutting element. The shield apparatus comprises a first lateral surface coaxially disposed about at least a proximal region of the cutting element. The shield apparatus defines a distal annular gap between the first lateral surface and the cutting element.

Therefore, it is an object to provide a novel shield apparatus for mounting to a powered trimmer of the type used to cut vegetative matter, and which can prevent vegetative matter from contacting the output shaft of such trimmer, or at least minimize such contact.

An object of the invention having been stated hereinabove, and which is achieved in whole or in part by the present invention, this and other objects will become evident as the description proceeds, when taken in connection with the accompanying drawings as best described hereinbelow.

Brief Description of the Drawings

Figure 1 is a side elevation view of a powered trimmer of known design;

Figure 2 is a detailed perspective view of a trimmer head assembly provided with the trimmer illustrated in Figure 1;

Figure 3 is a partially cutaway perspective view of a portion of the trimmer head assembly illustrated in Figure 2;

Figure 4A is a top plan view of an embodiment of a shield apparatus provided in accordance with the present invention;

Figure 4B is a side elevation view of the shield apparatus illustrated in Figure 4A;

Figure 4C is a side cross-sectional view of the shield apparatus illustrated in Figures 4A and 4B;

Figure 5 is an exploded view of a trimmer head assembly provided in accordance with the present invention, illustrating installation of the shield apparatus thereon;

Figure 6 is a perspective view of the trimmer head assembly of Figure 5 illustrated in assembled form;

Figure 7A is a bottom plan view of the trimmer head assembly illustrated in Figures 5 and 6; and

Figure 7B is a top plan view of the trimmer head assembly illustrated in Figures 5 and 6.

Detailed Description of the Invention

Referring now to Figures 1 – 3, an example is illustrated of a powered trimmer, generally designated **T**, of known design. Powered trimmers of the type illustrated in Figures 1 – 3 are used primarily for cutting vegetative matter

such as grass, weeds, and brush. Referring specifically to Figure 1, trimmer **T** comprises a trimmer gearcase or head assembly, generally designated **H**; a rotating cutting mechanism, generally designated **CM**; an elongate section or boom **B**; and a motor **M**. Motor **M** is powered by either internal combustion or electricity. In most current designs, trimmer head assembly **H** and motor **M** are mounted at opposite ends of boom **B** to afford better balance and comfort to an operator of trimmer **T**. Accordingly, a rotating drive shaft **DS** (see Figure 2) or other suitable force-transferring component can be disposed within boom **B** to couple the output power produced by motor **M** with trimmer head assembly **H** for driving cutting mechanism **CM**. Trimmer **T** usually includes a hand grip **HG** and a handle bar **HB** mounted to boom **B** for grasping by the operator, and can include a shoulder strap **SS** to enhance comfort. In addition, a clippings guard **G** can be mounted to boom **B**, head assembly **H**, or an interfacial region between boom **B** and head assembly **H** by means of a suitable mounting bracket **MB** and fasteners **F** (see Figure 3) to protect the operator from vegetative matter and other objects thrown outwardly by cutting mechanism **CM**.

Referring now to Figures 2 and 3, additional details of trimmer head assembly **H** and cutting mechanism **CM** are illustrated according to the known design. Trimmer head assembly **H** has a housing **12** comprising a proximal section **15** attached to boom **B** and a distal section **20**. As shown in Figure 3, distal section **20** includes a main body **22** and an outer shroud **24**. An annular space, generally designated **26**, is defined within distal section **20** between

main body **22** and outer shroud **24**. An output shaft **OS** extends outwardly from a bore **28** formed in main body **22** of distal section **20**, and includes a threaded end section **30** that enables cutting mechanism **CM** to be screwed thereon. Output shaft **OS** also includes a splined section **32** that matingly receives a spacer member **SM** for rotation with output shaft **OS**. Spacer member **SM** is interposed between distal section **20** and cutting mechanism **CM** to maintain proper alignment and spacing of cutting mechanism **CM** in relation to distal section **20**. To enable the operator to hold trimmer **T** at a comfortable angle while maintaining cutting mechanism **CM** substantially parallel with the ground surface, distal section **20** is disposed at an angle with respect to proximal section **15**. Thus, a suitable gear means such as bevel gearing (not shown) is contained within housing **12** to couple drive shaft **DS** with output shaft **OS** at the angle.

In the illustrated example, cutting mechanism **CM** includes a cartridge **35** having proximal and distal annular rims **37** and **39**, respectively. As can be appreciated by those of skill in the art, cartridge **35** can contain an internal spool (not shown) about which one or more lengths of polymeric cutting cord, such as nylon cutting cord **C**, are wound. The end of cord **C** extends outwardly from radially oriented orifice **41** formed in the side of cartridge **35**. Rotation of cartridge **35** about output shaft **OS** likewise causes rotation of cord **C** for cutting through vegetative matter. As the length of cord **C** external to cartridge **35** becomes shorter due to wear and impact, a bumper mechanism **43** can be actuated by the operator to release additional cord **C** from orifices **41**. As an

alternative to the use of cartridge **35** with cord **C** loaded therein, cutting chains or blades could be used.

As depicted in Figure 2, cutting mechanism **CM**, spacer member **SM**, and distal section **20** of trimmer head assembly **H** are spaced closely together along the axial length of output shaft **OS** (shown in Figure 3). In practice, however, gaps exist between these components and hence sections of output shaft **OS** remain exposed to the ambient environment. That is, in the area of trimmer head assembly **H** between proximal rim **37** of cutting mechanism **CM** and bore **28** of distal section **20** of head assembly **H**, there remains a significant opportunity for debris such as grass clippings or other vegetative matter to enter the spaces between these components and consequently wrap around, become lodged to, or otherwise contact output shaft **OS**. As will now be described with reference to Figures 4A – 7B, the present invention provides a shield apparatus, generally designated **S**, that prevents or at least minimizes the accumulation of vegetative matter on output shaft **OS** by minimizing exposure of output shaft **OS** to the ambient environment.

Referring now to Figures 4A – 4C, shield **S** comprises a first lateral wall **51** coaxially disposed about an axis **A** (see Figure 4C) that coincides with the axis of rotation of output shaft **OS** (see Figure 5). Preferably, first lateral wall **51** is cylindrical although it could be of any other suitable shape. A first transverse shield wall **53** is transversely disposed in relation to axis **A** and adjoins one end of first lateral wall **51**. First transverse shield wall **53** and first lateral wall **51** cooperatively define a first interior space, generally designated

55 in Figure 4C. As shown in the cross-sectional view of Figure 4C, a first aperture **57** is formed through the central portion of first transverse shield wall **53**. First aperture **57** is coaxially centered about axis **A** to admit output shaft **OS** therethrough. Shield **S** also can comprise a second lateral wall **61** extending axially from an outside surface **53A** of first transverse shield wall **53** to define a second interior space, generally designated **65** in Figure 4C. Preferably, second lateral wall **61** is cylindrical although it could be of any other suitable shape. Second lateral wall **61** preferably has radial dimension (e.g., diameter) less than that of first lateral wall **51**. Second lateral wall **61** can be directly attached to outside surface **53A** of first transverse shield wall **53** or, as shown in Figure 4C, can alternatively be attached to a second transverse shield wall **63** that is attached to first transverse shield wall **53** by welding or other means. A second aperture **67** can be formed through the center of second transverse shield wall **63** in general alignment with first aperture **57** of first transverse shield wall **53** to accommodate the extension of output shaft **OS** through first and second apertures **57** and **67**.

It thus can be seen that the design of shield **S** can in one embodiment include two cup-shaped portions of different sizes, with one cup being inverted with respect to the other cup. The first cup is bounded by first transverse shield wall **53** and first lateral wall **51**, and encloses first interior space **55**. The second cup is bounded by first transverse shield wall **53** (or second transverse shield wall **63** when provided) and second lateral wall **61**, and encloses a second interior space, generally designated **65**. As described in more detail

below, this design enables shield **S** to be provided as an accessory component for retrofitting to conventional trimmers such as trimmer **T** illustrated in Figures 1 – 3. Moreover, as will become evident from the description below relating to Figure 6, the first cup can at least partially enclose cutting mechanism **CM**, and the second cup can at least partially enclose distal section **20** of trimmer head assembly **H**.

To facilitate the mounting of shield **S** to trimmer head assembly **H** without interfering with existing components, shield **S** is designed to be mounted coaxially about output shaft **OS** for rotation therewith, as described hereinbelow and illustrated in Figures 5 and 6. This configuration avoids having to mount shield **S** directly to housing **12** of trimmer head assembly **H**, which would require the use of fasteners and modification of housing **12** to receive such fasteners.

While shield **S** could be mounted directly to output shaft **OS**, the interface between shield **S** and the output shaft **OS** can be improved by providing an insert or adapter member, generally designated **70** and shown in Figures 4A – 4C. Adapter member **70** comprises a hollow cylindrical portion **71** defining a bore through which output shaft **OS** can extend. The inside surface of cylindrical portion **71** includes features to enable adapter member **70** to be mated with output shaft **OS** such that rotation of output shaft **OS** likewise causes rotation of adapter member **70**. In the present example, axially oriented splines **71A** are formed on the inside surface of cylindrical portion **71** to mate with the grooves of splined section **32** on output shaft **OS** (see Figure 5).

Cylindrical portion **71** is inserted through first aperture **57** of first transverse shield wall **53**, and through second aperture **67** of second transverse shield wall **63** when provided, so as to mount shield **S** in non-contacting relation to output shaft **OS**. To axially retain shield **S** on adapter member **70**, adapter member **70** further comprises first and second annular portions **75** and **77** transversely disposed in relation to axis **A** on either side of first transverse shield wall **53**. In the illustrated example, first annular portion **75** abuts first transverse shield wall **53**, and second annular portion **77** abuts second transverse shield wall **63**. Adapter member **70** also can comprise a coaxial adapter wall **79** coaxially disposed about cylindrical portion **71** and axially extending from second annular portion **77**. The function of coaxial adapter wall **79** is described hereinbelow.

In other embodiments, first annular portion **75** of adapter member **70** can be omitted. In this case, shield **S** is axially retained on adapter member **70** as a consequence of securely mounting shield **S** and adapter member **70** on output shaft **OS** as described hereinbelow with reference to Figure 5. As an option, to assist in maintaining an aligned, centered relation between adapter member **70** and shield **S**, adapter member **70** could be provided with one or more bosses or ribs (not shown) that engage with complementary notches or grooves (not shown) formed in shield **S**. Alternatively, bosses or ribs could be provided on shield **S** and complementary notches or grooves formed on adapter member **70**. In still other embodiments, again in the case where first annular portion **75** is not provided, cylindrical portion **71** of adapter member **70**

does not extend through first aperture **57** of first transverse shield wall **53** of shield **S**, but instead is merely coaxially aligned with first aperture **57**.

Shield **S** and adapter member **70** are preferably constructed from impact-resistant polymeric or metallic materials. By way of example, suitable polymeric materials include polypropylene and glass fiber-reinforced nylon, and suitable metallic materials include readily available alloys such as steels.

Referring now to the exploded view of Figure 5, the installation of shield **S** on trimmer head assembly **H** is illustrated. To facilitate the mounting of adapter member **70** to shield **S**, adapter member **70** can be initially provided in two adapter parts, which are illustrated as upper adapter part **70A** and lower adapter part **70B**. Upper and lower adapter parts **70A** and **70B** are assembled on either side of first transverse shield wall **53**, and thereafter affixed together to form adapter member **70** as shown in Figure 4C by welding or other suitable means. Preferably, adapter member **70** is pre-assembled in this manner so that shield **S** is commercially distributed to the end user in the form illustrated in Figures 4A – 4C. Alternatively, as described hereinabove, lower adapter part **70B** can be omitted, in which case cylindrical portion **71** is unitary with upper adapter part **70A**. Shield **S** can be coaxially mounted to output shaft **OS** of trimmer head assembly **H** by mating adapter member **70** (parts **70A** and/or **70B**) to splined section **32** of output shaft **OS**. Spacer member **SM** can then be mated to splined section **32** in abutment with lower adapter part **70B**. Finally, cutting mechanism **CM** can be screwed onto threaded end section **30** of output shaft **OS**, axially bearing against spacer member **SM** such that shield **S** and

adapter member **70** are mounted securely to output shaft **OS**. It can thus be seen that as output shaft **OS** rotates to drive cutting mechanism **CM**, shield **S** likewise rotates although such rotation is not a necessary condition of the invention.

Referring now to Figure 6, trimmer head assembly **H** is illustrated in assembled form with shield **S** installed in accordance with the invention. First lateral wall **51** of shield **S** is coaxially disposed about cutting mechanism **CM**, and is closely adjacent to proximal rim **37** of cutting mechanism **CM**. It will be noted, however, that first lateral wall **51** is adjacent to only an upper or proximal section of cutting mechanism **CM** so as not to interfere with the rotation of cords **C**. The axial position of cutting mechanism **CM** relative to first lateral wall **51** can vary, as it is only preferable that proximal rim **37** be at least partially covered or overlapped by first lateral wall **51**. Second lateral wall **61** of shield **S** is coaxially disposed about distal section **20** of trimmer head assembly **H**, at the end of distal section **20** from which output shaft **OS** (see Figure 5) extends, and is closely adjacent to this end of distal section **20**. As a result, the space surrounding output shaft **OS** between cutting mechanism **CM** and trimmer head assembly **H** is effectively isolated from the ambient environment. This prevents vegetative matter, especially clippings cut and thrown by cutting mechanism **CM**, from contacting output shaft **OS** or at least minimizes such contact. As shown in Figure 7A, only a narrow distal annular gap **DG** remains between first lateral wall **51** and cutting mechanism **CM**. As shown in Figure 7B, only a narrow proximal annular gap **PG** remains between second lateral wall **61** and

distal section **20** of trimmer head assembly **H**. Additionally, referring back to Figure 5, it can be seen that coaxial adapter wall **79** of adapter member **70** extends into annular space **26** of distal section **20** between its main body **22** and outer shroud **24**, thereby further isolating output shaft **OS** at bore **28** of distal section **20**.

It is envisioned within the scope of the invention that shield **S** can be installed with trimmer head assemblies and cutting mechanisms of different sizes. Hence, the respective widths of proximal annular gap **PG** and distal annular gap **DG** can vary, depending on the size of either cutting mechanism **CM** or distal section **20** of trimmer head assembly **H**. Preferably, for the shield **S** to be effective, the width of either proximal annular gap **PG** or distal annular gap **DG** should range from approximately 1 mm to approximately 10 mm. Even more preferably, the width ranges from approximately 1 mm to approximately 2 mm.

It will be understood that trimmer head assembly **H**, when provided with shield **S** as shown in Figure 6, is compatible for use with any conventional powered trimmer such as trimmer **T** shown in Figure 1. In addition, shield **S** does not adversely affect the normal operation of trimmer **T**. Instead, it will be appreciated from the foregoing description that shield **S**, by preventing or at least minimizing contact between vegetative matter and output shaft **OS**, improves the performance of trimmer **T** and reduces the maintenance and cleaning required for trimmer **T**.

It will be further understood that various details of the invention may be changed without departing from the scope of the invention. Furthermore, the foregoing description is for the purpose of illustration only, and not for the purpose of limitation, as the invention is defined by the claims as set forth hereinafter.